PATENT SPECIFICATION 818,073

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International Classification:—B63b. F25j.

COMPLETE SPECIFICATION.

Containers for Liquefied Gas Transportation.

We, NORTH THAMES GAS BOARD, a British Body Corporate, of 30, Kensington Church Street, London, W.8, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to ships in which containers for transporting liquefied gas, for example, liquefied natural or petroleum gas are mounted.

It is intended that the liquefied gas should be transported in bulk amounting to hundreds or thousands of tons in containers having diameters of upwards of 10 feet and lengths of upwards of 25 feet and the manner in which such containers can safely be secured within ships is one of the problems with which this invention is concerned. A further problem is occasioned by the fact that at the low temperatures involved in handling liquefied gases mild steel becomes brittle and consequently not only does the container have to be made of a cold resistant metal or alloy but consideration has to be devoted to its insulation from the surrounding parts of the ship's structure.

According to the present invention, a ship has an upright cylindrical container for transporting liquefied gas mounted in it by the following means:— the container, which is made of a metal or alloy resistant to low temperatures, is enclosed within a casing and has domed ends and cylindrical skirt-like portions which extend in continuity with the cylindrical surface of the container and project beyond the domed ends, the skirt at the lower end being turned inwards to form a socket which fits over the spigot fixed to the ship's structure and projecting within the casing and the skirt portion at the upper end engaging around a projection on the underside of a lid or cover of the casing, the casing being lined with a layer of heat insulating material which is also interposed between the spigot and the projection and the adjacent skirt portions.

Preferably, the projection on the underside of the cover or lid is a circular spigot which fits within the upper skirt. Balsa wood has been found to be the most suitable material of which to form the heat insulating layer interposed between the spigot and the projection and the adjacent skirt portions, but a powdered insulating material may be used to line the casing.

A single casing may accommodate one or a number of containers.

The invention will now be described by way of example only with reference to the accompanying drawings in which:

Figure 1 is a vertical section through a casing accommodating a single container;

Figure 2 is a vertical section through one container in a casing accommodating a number of containers;

Figure 3 is a sectional plan through a casing accommodating nine containers, and

Figure 4 is a section on the line IV-IV of Figure 3.

Each of the containers shown in the drawings comprises a cylindrical tube 5 with domed ends 6 and 7 of aluminium alloy, stainless steel or other low temperature resisting material. The domed end 7 has openings at 8 and 9 to accommodate a gas discharge duct having a valve 10 and a filling pipe 11 respectively.

Cylindrical skirts 12 and 13 extend in continuity with the cylindrical wall of the tube 5 and are in thermal contact with the domed ends 6 and 7 beyond which they project. The skirts 12 and 13 are welded to the container.

The skirt 12 has an inturned extension 14 formed from two right angle bends, such that a socket is formed by an annulus extending from the lower end of the skirt 12 towards the domed end 6. Strengthening members 15 are fixed between the inturned extension 14 and the skirt 12. A tubular spigot 16 is secured to the ship's bottom. The spigot projects within a surrounding casing 20 and is a clearance fit within the socket which is placed over it. A layer of balsa wood 17 is interposed between the socket and the outer surface of the spigot 16 and this layer extends outwards round the spigot 16 to be continuous with a heat insulating layer 18 surrounding the cylindrical wall of the tubular container 5 and forming a lining to the casing 20. Hence the tubular container 5 is completely insulated from the ship's structure. A cover or lid 19 of the casing 20 is similarly lagged with heat insulating material 21 which forms a layer interposed between the upwardly extending skirt 13 and a downwardly extending spigot 22 projecting from the cover 19.

When the casing is adapted to accommodate a number of containers as shown in Figs. 2, 3 and 4 the heat insulating layer lines the top, base and walls of the casing but does not surround the cylindrical wall of each individual container. In this form of construction the required number of spigots are fixed to the ship's structure and a corresponding number appropriately located on the cover or lid of the casing. The lower spigot and the lower socket of the container fit together as in the construction described above for the accommodation of a single container so that each container is completely insulated from the ship's structure.

The discharge valve 10 and the filling pipe 11 project through the cover 19. When the container is to be filled with liquefied gas a stopper 24 on the pipe 11 is removed to allow the liquefied gas to be poured into the container. Any gas which is evaporated can thus escape through the discharge valve 10.

When the container has been installed in either a single casing or a common-box type of casing and fitted over the bottom spigot secured to the ship's structure and the spigot projecting downwardly from the cover has been inserted within the top cylindrical skirt of the container, the container is filled with liquefied gas as described above. The consequent contraction of the container causes the projecting skirt portions or sockets to grip the two locating spigots through the interposed lining of insulating material. This grip is maintained throughout the period whilst the container contains liquid gas.

WHAT WE CLAIM IS:—

1. A ship in which an upright cylindrical container for transporting liquefied gas is mounted, the container, which is made of metal or alloy resistant to low temperatures, being enclosed within a casing and having domed ends and cylindrical skirt-like portions whch extend in continuity with the cylindrical surface of the container and project beyond the domed ends, the skirt at the lower end being turned inwards to form a socket which fits over a spigot fixed to the ship's structure and projecting within the casing and the skirt portion at the upper end engaging around a projection on the underside of a lid or cover of the casing, the casing being lined with a layer of heat insulating material which is also interposed between the spigot and the projection and the adjacent skirt portions.

2. A ship according to claim 1, in which the projection on the underside of the cover or lid is a circular spigot which fits within the upper skirt.

3. A ship according to claim 1 or claim 2, in which the layer of heat insulating material interposed between the spigot and the projection and the adjacent skirt portions is of balsa wood.

4. A ship according to any one of the preceding claims, in which a filling pipe and a discharge duct extend through the upper domed end and through the cover or lid, the discharge duct having a closure valve.

5. A ship according to any one of the preceding claims, including a number of containers within a common casing.

6. A ship according to claim 1, in which a container is mounted substantially as described with reference to Figure 1 of the accompanying drawings.

7. A ship according to claim 5, in which a number of containers are mounted substantially as described with reference to Figures 2 to 4 of the accompanying drawings.

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PROVISIONAL SPECIFICATION.

Containers for Liquefied Gas Transportation.

We, NORTH THAMES GAS BOARD, a British Body Corporate, of 30, Kensington Church Street, London, W.8, do hereby declare this invention to be described in the following statement:—

The invention relates to a container for

transporting by ship liquefied gases described as Natural or Petroleum gases.

It is intended that these should be transported in bulk amounting to hundreds or thousands of tons in containers having diameters upwards of 10ft. and length upwards of 25ft and the manner in which such containers can be secured within ships is one of the problems with which this invention is concerned. A further problem is occasioned by the fact that at the low temperatures involved mild steel becomes brittle and consequently not only does the container have to be made of a cold resistant metal or alloy but consideration has to be devoted to its insulation from the surrounding parts of the ship's structure.

In accordance with the invention a cylindrical container of metal or alloy resistant to low temperature has domed ends set within the cylinder and the extended portions of the cylinder form skirts or sockets which are located by internal spigots fixed to the ship's structure and grip the spigots through the intermediary of the heat insulating layer when the container is filled with liquefied gas.

If the tubular envelope forms the socket at each end it may be directly secured at the base to the ship's structure which has advantages from the point of view of securing the container firmly in position. There is however, the disadvantage that the skirt has to be warmed in the neighbour of its junction with the ship's structure so as to maintain the surrounding ship's structure at approximately atmospheric temperature. This disadvantage may be overcome by providing a reverse socket housed within the skirt to form an annular. This may then be fully insulated from the ship's structure.

In one form described by way of example, the container comprises a tube with domed ends of aluminium alloy or of stainless steel, one of the ends being provided with a filling orifice and a discharge valve. The domed ends of the container are surrounded by skirts of the same material which are in thermal contact with the ends, being welded to the container. A tubular spigot is secured to the ship's bottom and is a clearance fit within the skirt which is placed over it during the installation within the ship and which is secured to the ship's structure. Heat insulating material in block form is interposed between the inner surface of the skirt and the outer surface of the spigot and further heat insulating material covers the total upper surface of the spigot so that the ship's structure adjacent to the lower end of the container is insulated from the low temperature of the container except immediately adjacent the junction between the skirt and the ship's structure. Similar heat insulating material surrounds all the cylindrical wall of the tubular container except for a small length adjacent the junction point of the skirt and the ship's structure which length has to be continuously warmed when the container is filled with liquid gas.

The top of the container is similarly lagged with heat insulating material and a heat insulating packing is interposed between the upwardly extending skirt at the top of the tubular container and a downwardly extending spigot secured to the ships' structure which form a top mounting for the upper end of the apparatus.

When the container and its surrounding envelope have been installed over the bottom spigot and the top spigot has been mounted within the top skirt of the tubular envelope, the container is filled with liquid gas and the consequent contraction of the container and tubular envelope causes the projecting sockets to grip the two spigots through the interposed lining of insulating material. This grip is maintained throughout the period while the container contains liquified gas.

Turning now to an alternative form of construction in which the lower socket is not formed by but is housed within the skirt projecting from the tubular envelope it should be pointed out that this form obviates the need for continuous heating of any junction since it is no longer necessary for the tubular envelope to come into contact anywhere with the ship's structure. In this form of construction the engagement of the socket and spigot adjacent the top of the container may take the same form as in the previous construction but at the bottom the skirt has an inturned extension formed from two right angle flanges such that the socket is formed by an annulus extending between the lower end of the skirt and the container. This fits over the spigot as in the previous constructions and a block heat insulating material is interposed between the socket and spigot. The heat insulating material also extends outwards round the spigot to be continuous with the heat insulating material surrounding the tubular envelope to form a bearing surface for the container and hence the tubular envelope is completely insulated from the ship's structure.

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Fig. 1.

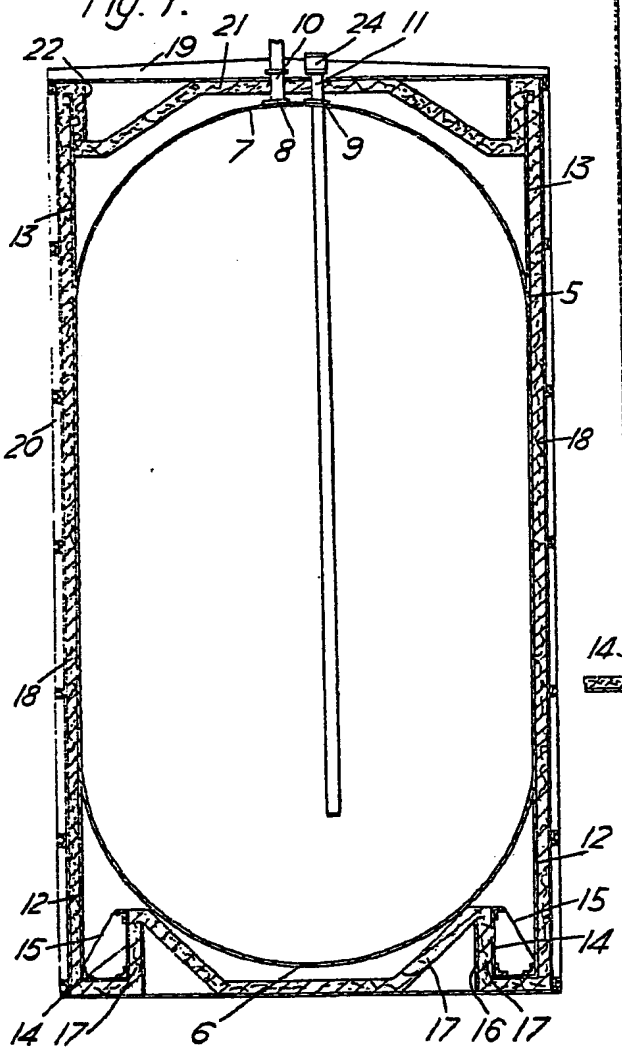
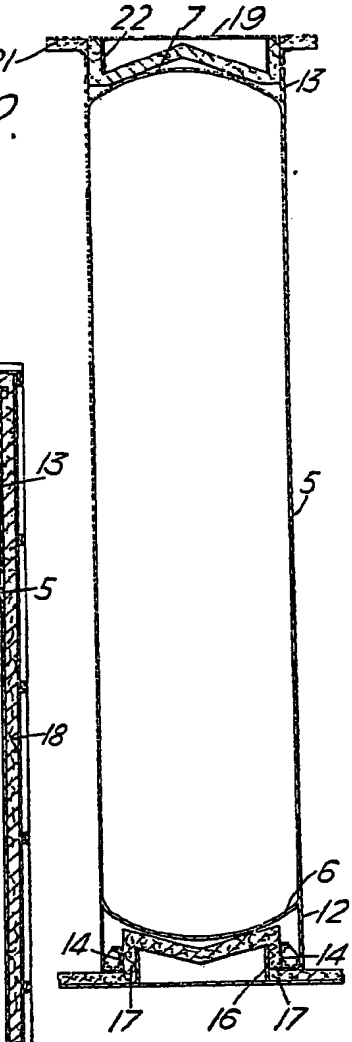


Fig. 2.



818,073 COMPLETE SPECIFICATION
2 SHEETS This drawing is a reproduction of the Original on a reduced scale.
SHEETS 1 & 2

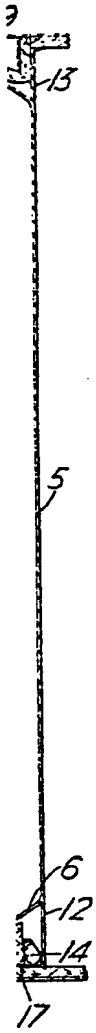


Fig. 3.

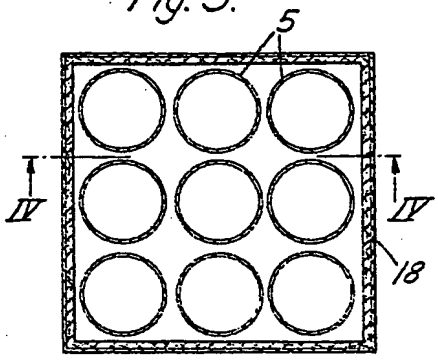


Fig. 4.

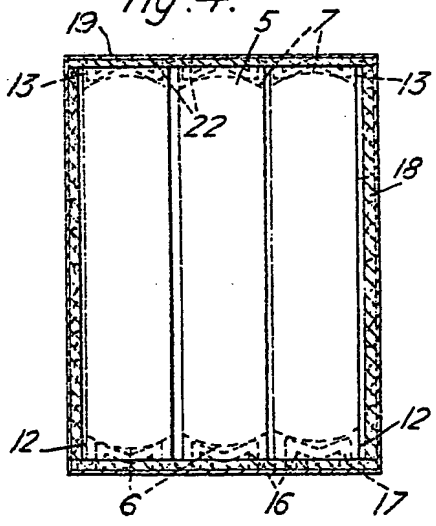


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Fig. 1.

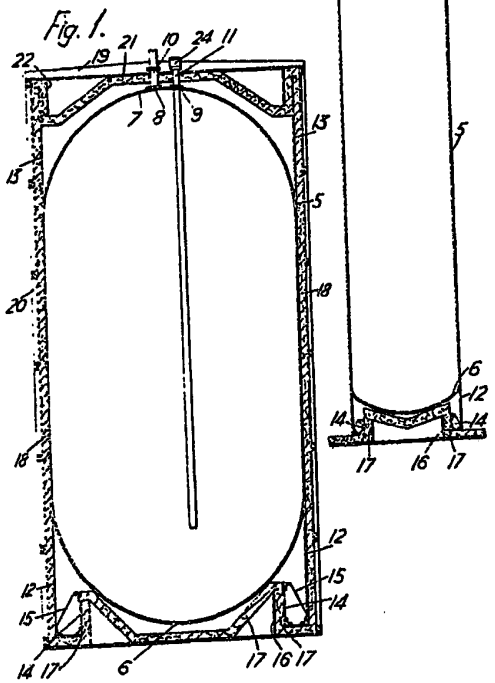

Fig. 2.

Fig. 3.

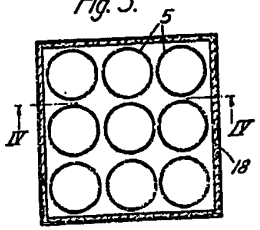

Fig. 4.